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MANUAL TRAINING IN HIGH SCHOOL COURSES

DISCUSSION AND RECOMMENDATIONS

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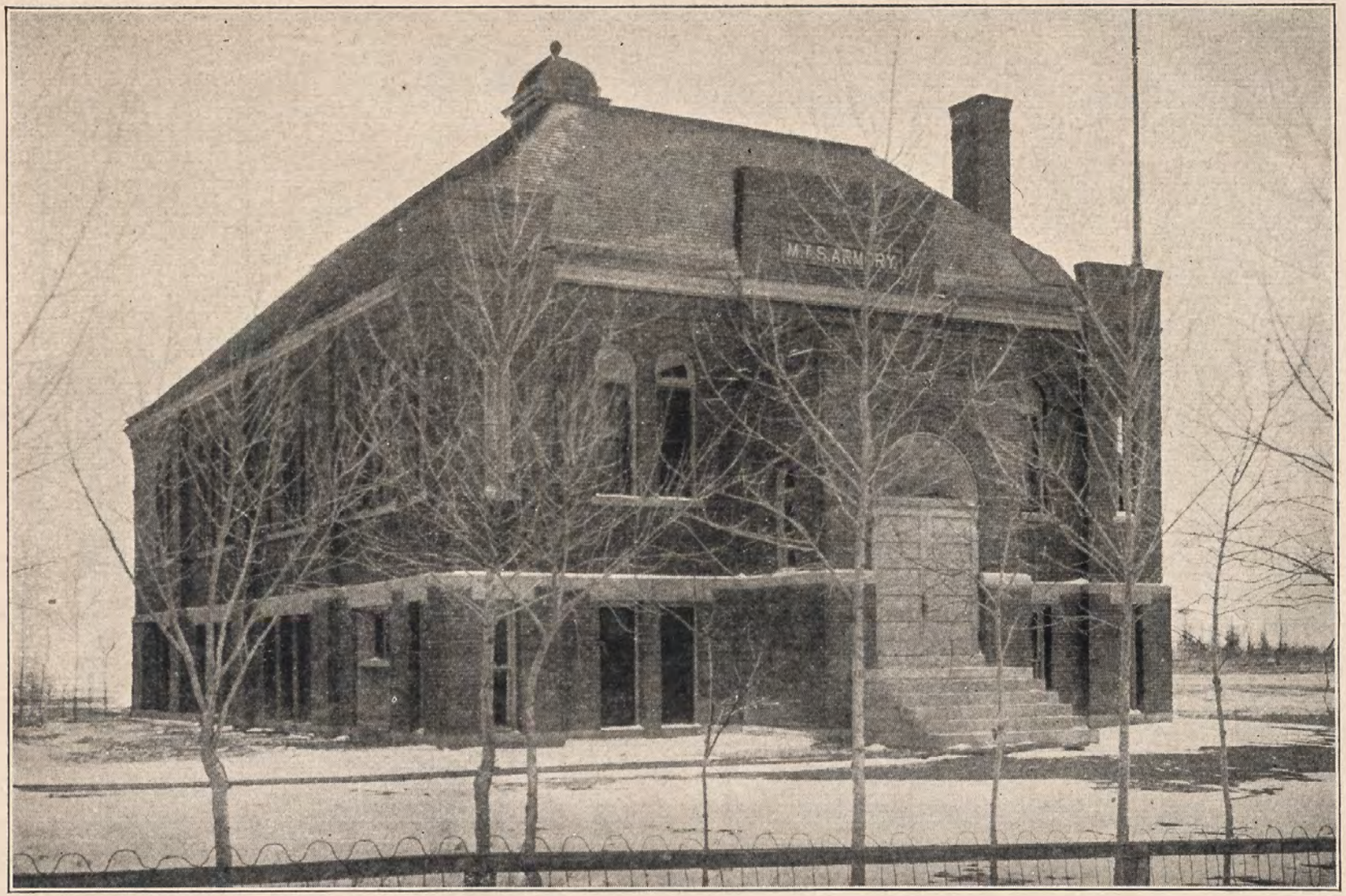


Armory.

Manual Training Building

INDUSTRIAL EDUCATION.

W. M. Kern.

AN ADDRESS BEFORE THE STATE TEACHERS' ASSOCIATION
FARGO, NORTH DAKOTA, DECEMBER 30TH, 1906.

Industrial education, in the limited sense, has been defined as training in industrial conditions, processes and organizations; in the comprehensive sense it is that form of education in which the pupil's receptive and expressive powers are jointly trained. The term recognizes three separate classes of schools, fundamentally related, yet distinct in purpose, and somewhat confused in the average mind. The first of these to obtain recognition was The Technical School:

The Technical School

There was a time, not altogether in the past, when leaders in educational thought resisted the growth and extension of science. The monastic system of the sixth century, an outgrowth of the spirit of asceticism, stood as the opponent of that type of original research which underlies all true scientific progress. Any new scientific discovery that seemed to refute an opinion already accepted and in accord with mediaeval theology brought condemnation in its wake. Science and applied science are modern. It was not until the last century that science was accorded recognition as a powerful agency in promoting civilization. Pestilence and plague are no longer visitations of a divine power sent upon man because of his meanness, except to the degree in which meanness is ignorance and laziness. Havana clean is Havana healthy. Mechanical power is a triumph of the scientific spirit, and mechanical power, in the last century, by the application of steam and electricity to industry, revolutionized our material and social life. It is as the champion of applied science, the application of scientific truth to the material affairs of life, that the technical school has been established. It recognizes the universe as under the reign of law: that the progress of life on the globe responds to unfailing, invisible and immutable law; that the events of today are the results of yesterday's causes. It would discover, unfold and apply these laws for man's material and spiritual good. These schools are the final flower of scholasticism, since they are founded upon reason as opposed to the dogma of authority.

The first technical school seems to have originated in France in 1760 for training engineers for the government service. Count

Dacotah Hall.

The second class of industrial schools is Trade Schools. These follow technical schools in point of time. They aim to train workmen in planning and arranging their work; in the economic use of materials; and in the specific details of a particular trade. Education is subordinate to maximum earning capacity. They would increase the student's power to earn in order that he may lead a happier, better life. The apprenticeship system of the early part of the past century has fallen into disuse and the trade school is an attempt to train workmen in its stead. The course is short, relatively superficial, and greater stress is laid upon practice than upon theory. Germany leads in this class of schools. Berlin alone has twenty-eight (28) trade schools and in them practically every important trade is represented. Evening classes are common and Sunday classes by no means rare. Switzerland and France are close seconds, while in both England and the United States such schools have never been numerous. Among the trades taught are weaving, molding, turning, engraving, etching, dyeing, painting, embroidery, watch-making, plumbing, etc., etc., ad infinitum. Often the schools are connected with some commercial or manufacturing establishment, and organized labor is regarded as less friendly to them than to other industrial schools. The New York Trade School, established in 1881, is avowedly of this class. Its prime purpose is to provide young men, having a bent for mechanics, the opportunity of acquiring a knowledge of some trade that will afford its possessor a means of livelihood. Richard Auchmutty found that numerous boys, whom the trade unions kept from being apprenticed, were unable to learn their father's honest trade and were consigned to the ranks of loafers and tramps. He founded this school and J. Pierpont Morgan endowed it. From the first it has met with marked success in spite of the attempt to place its graduates under the ban, and has been influential in founding similar schools in other cities. Only the common trades are taught, in the most practical way, by skillful and long-experienced mechanics, and its graduates aim to enter immediately upon work. The agricultural college stands midway between technical and trade schools, certain of its courses approaching those offered by the technical schools, while others are trades pure and simple. These schools originated under the Morrill Bill enacted by Congress in 1861 for the "endowment, support and maintenance" of at least one college in each state to teach "agriculture and the mechanic arts." Under this and subsequent laws every state and territory in the Union now has such schools. Trade schools tend to follow, historically, the progressive relation of industry to science. Industrial progress has always preceded science, as mining, metallurgy; sailing, navigation; housebuilding, architecture; doctoring, medicine, and the most advanced of them add, to practical training, instruction in the scientific principles underlying the art. Such is the Advanced School of Weaving at Lyons, France;

Trade Schools

Rumford followed with a similar school in London in 1799. The first German school of this type was the school of mines at Freiberg, in 1824, designed to develop mine engineers. From these beginnings the spread of high-class technical schools throughout Europe has been rapid and their influence far-reaching. Today Switzerland probably leads the world in this particular grade of school, the Zurich Polytechnic being regarded as the ultimate type of its class. In the United States the first of these schools was Rensellaer Polytechnic, established at Troy, New York, in 1824, to meet the demand for technical training, until that date supplied by foreign countries. Since then Yale University has established the Sheffield Scientific School (1847), Harvard the Lawrence Scientific School (1848), Dartmouth the Chandler Scientific School (1852), and Massachusetts the Massachusetts Institute of Technology (1861), while other leading universities, and quite generally our state universities, have devoted vast sums to founding schools for instruction in applied science. In this connection it is interesting to note that the German representatives to the St. Louis Exposition, in the report to their government, stated that German manufacturers had nothing to fear from American competition because of our lack of skilled workmen and our lack of the means of producing them. Prof. Thurston of Yale, who recently returned from a tour of inspection abroad, reports that to equal Germany we need 20 technical universities having in their schools of engineering 50 instructors and 500 students each, and 2,000 manual training schools each having not less than 10 instructors and 200 students. These schools are all of advanced grade. There is a four years' course above the high school. Such courses generally demand neither Greek nor Latin, but the requirements in English, German or French, Mathematics and History are very rigid. The technical school is thus a high-class handicraft school combining theory and practice; a school in which the underlying scientific principles upon which the art is based are fully explained and demonstrated in laboratory instruction. They recognize that the school that teaches mere facts about things and leaves the student in ignorance of the underlying principles not only ignores nature's most fundamental laws but fails to train the reasoning powers to any high degree. The experience and testimony of employers of labor, especially in the more advanced branches of mechanics, bear out the statement that those students who have not mastered the underlying principles, who have allowed the laboratory practice to degenerate into mere mechanical routine, have almost fatally crippled their power to rise to the higher rounds of real success, and have paid altogether too great a price for the mechanical training acquired. These institutions take rank, in points of efficiency, with our best universities. They are an outgrowth of the commercial and industrial struggle for the world's markets. America has the resources. To win, she must have the technical efficiency.

no great progress. Germany and Switzerland are neither of them so prominent in manual training as in technical and trade schools. Since 1882 manual training has been obligatory in the primary schools of France. England is doing more than in trade schools, while in the United States this type of school has had its most pronounced success.

History of Manual Training

Manual training came to us through the Russian exhibition at the Centennial in 1876 by way of the Massachusetts Institute of Technology, and so rapidly has it spread that quality has fallen short of quantity. In 1879 St. Louis established the first manual training school in the United States. It was of secondary grade, was neither a technical nor a trade school, and sought to provide an all 'round complete training. It divided the day about equally between laboratory work—manual exercises and drawing—and regular academic subjects. In 1885 the state of New Jersey passed a law under which the state duplicates any amount from $500 to $5000 raised by a city for manual training. In 1895 Massachusetts passed a law making it obligatory upon all cities of 30,000 or more inhabitants to establish and maintain manual training in a high school. Today more than two-thirds of the cities of the United States having 8000 population and over teach manual training in some of the grades, and there is hardly an important city that does not offer a secondary course. Prior to 1880 there was probably not a score of educators in America who believed in the intellectual value of manual training. Frances A. Walker was chairman of the first committee of the N. E. A., appointed in 1882, to investigate manual training. This committee recommended its introduction into grammar and high schools "for developing skill of hand in the fundamental manipulations connected with the industrial arts, *and also as a means of development.*" This recommendation brought open war into the N. E. A. In 1885 the N. E. A. voted to lay on the table a resolution recommending the introduction of manual training into the public schools. For the past ten years there has been practically no intelligent opposition to manual training.

Manual training as we know it is peculiarly American. In comprehensiveness of courses and costliness of equipment nothing in Europe compares with it. The courses offered in all manual training schools are substantially the same: joinery, wood-turning, forging, pattern-making, molding, chipping, filing, machine shop practice and mechanical drawing for boys; cooking and sewing for girls; and from the kindergarten and high school manual training has gradually gone into the grades of the elementary school in various forms.

To understand manual training one must get hold of certain fundamental organizing principles, otherwise it will seem a mere jumble; then it thrills with interest and orderly procedure. Strictly

the School of Weaving and Dyeing at Yorkshire, England; and the Lowell Textile School at Lowell, Mass. In these institutions the student is taught not only weaving, pattern designing, and the mechanism of manufacture; he is also taught the chemistry and technology of dyeing.

Under this title may also be grouped that class of philanthropic and reformatory schools, though not strictly trade schools, in which industrial work is taught to boys and girls at a comparatively early age. Of such schools the "Ragged School" of England and those of the George Junior Republic are promnient types. The aim varies from keeping boys off the street to teaching them a trade. New York City has 33 such schools in 24 different wards, not counting evening schools, maintained by various aid societies. They enroll each year some 15,000 boys and girls—slum children, who can not be accepted by the public schools either because they are ragged and dirty or because they are able to attend but part of each day. Their courses are comprehensive, beginning with soap and water. They have been a Godsend to the city. Out of them have come governors, teachers, lawyers and editors, conspicuous ornaments of society, and of this type of school Stanley Hall has recently said: "My pride bows low before the pupils of our best institutions for negroes, Indians, and juvenile delinquents whose training is often in more than a score of industries and who, today, in my judgment, receive the best training in the land, if judged by the annual growth in mind, morals, health, physique, ability and knowledge all taken together."

Manual Training Schools

The third type of industrial school is the Manual Training School, designed to afford instruction in tool work as a part of a complete educational discipline. The term comprehends constructive handwork for both boys and girls in public schools as part of a system of education. Manual training as a part of a system of school instruction was first completely worked out in Sweden about 1876, though Della Voss, of the Imperial Technical School of Moscow, had previously elaborated a system of laboratory instruction for mechanic arts. In 1858 Uno Cygnaeus originated a plan for manual training for the elementary schools of Sweden, the purpose originally being to counteract the effects of the concentration of the population in cities and the consequent decay of home industries. Since his time Sweden has led European thought in manual training, and has been widely influential in spreading the manual training idea. Underlying the Swedish system were a few fundamental principles: all labor must be combined with thought; it must be done with exactness; must be neat and clean; must strengthen the body, develop the sense of form, and be rich in manipulative detail; in other words, must be educative. Manual training has spread from Sweden to all other countries, though with us sloyd has made

6. *It is in harmony with the American spirit:* The mediaeval state, under the caste system, prescribed the vocation of its citizens; the boy must follow the father's trade. To this doctrine the American spirit is antagonistic. It would train harmoniously all the faculties, open the door to genius, and leave the individual free to select his own vocation. The advocates of manual training recognize the high value of the classics and sciences in a course of study, and hold them at their full value; but they likewise recognize the Law of Variation as inherent in human life; that there are certain pupils in whom the perceptive and constructive faculties are dominant, and they believe that the school should do as much for them as for the pupils in whom the memory or language faculty is the prominent intellectual power.

7. *It is moral training in the concrete:* Manual training emphasizes exactness and accuracy and teaches truth through inductive processes.

8. *It nourishes the instinct for activity and directs it towards useful and helpful ends:* Dr. Henry Sheldon has made a study of the spontaneous institutional activities among children. He shows that physical activity is the key-note of the spontaneous organizations among boys. Of 623 voluntary boys' societies studied, 85 ½ per cent of the whole were athletic, predatory and industrial; boys finding their greatest interest in physical activity. Girls, left to themselves, organize industrial associatons more than any other one kind. It would seem wise to use his natural instincts in educating the child.

9. *It erects a barrier against idleness, the mother of all crimes:* Where children are wisely employed according to their instincts there will be little trouble with discipline.

10. *The individual gains, not only qualitatively but quantitatively, through a rational system of manual training:* Dr. H. H. Belfield, in a report to the U. S. Dept. of Labor (1892) carefully summarized the findings of English and American educators as to the comparative quality and quantity of work accomplished by students who *did* and those who *did not* take hand work. The universal consensus of opinion is to the effect that pupils who take manual training as a part of the regular shop work accomplish as much, in academic subjects, as those who devote the same number of hours to academic subjects alone; and that the combination of mental and manual training does not diminish the amount of purely academic work accomplished.

Whatever our opinion, the battle for manual training has practically been won. Its gradual introduction into school courses in one of the marvels of the opening of the new century. Prof. James is authority for the statement that "the most colossal improvement which recent years has seen in secondary education lies in the introduction of manual training schools, not because they will give us a

speaking, manual training is not utilitarian, but is designed to combine materials, mechanical means and constructive processes for education. The arguments deduced in its favor are many, a few of the more important being:

1. *The argument from psychology:* "It is the mind that sees and strikes the blow; the eye and hand are simply the instruments it uses. Manual training is mental training." (Butler).

2. *The argument from pedagogy:* "Teaching, both in matter and method, must be adapted to the capabilities of the taught." (White)

Arguments for Manual Training

Man's nature is dual, receptive and expressive. Ten minutes of draughting, construction and applied fractions is worth more than ten hours of mere rote training. Ten minutes of sane voluntary obedience to law is of greater value in the formation of character than ten hours of moralizing. "Education is the organizing of acquired habits of conduct and tendencies to behavior" and "an impression which simply flows in at the pupil's ears and in no way modifies his active life is an impression gone to waste." (James) Tradition teaches that mental life is made up of impressions and ideas resulting from such impressions. Science teaches that "mental activity is always acccompanied by bodily activity" (Judd). Manual training is Pestalozzianism applied; "Keine Kentnisse ohne Fertigkeiten." Every great educator from Luther to Horace Mann has recognized the advantages of manual work.

3. *The social argument:* A man's value to himself and society depends as much upon what he *does* as upon what he *thinks*. Not only must the individual be intellectually efficient, he must be industrially efficient. He must not be merely good, he must be good for something. Dante places in the fore-courts of hell those who simply avoided the bad but did not strive after the good. The nations that have studies the classics and philosophies *alone* are China and India.

4. *The economic argument:* That education which trains the receptive and expressive faculties jointly develops an order of ability by which the pupil is better enabled to make his way. Ninety-five per cent of mankind earn their livings by their hands. Of the 150 vocations known to man eight only are purely intellectual, the others combining the intellectual and manual. In all of them manual training is valuable, and in all but the minor few is fundamental. Shall the highest type of education be proscribed merely because it happens to involve "bread and butter" skill?

5. *Manual training is an academic kindergarten:* The teacher who performs an experiment in the presence of his class follows the dictum of Pestalozzi. The teacher who has the pupil perform the experiment and, as far as possible, create the conditions under which he works is a disciple Froebel. Things are the signs of ideas.

inferior race, and that serenity and equanimity," fostered and developed by methodical labor, "are the prime characteristics of civilized man in the Nineteenth Century." Not only does methodical industry underly our material civilization; it is at the basis of all morals. Moreau has shown that "idleness and vagabondage are almost always with children the source of crime." Sichart found, out of 1848 thieves, that 52 per cent hated work. Ferriani found that of 2000 minor criminals 55 per cent were "altogether idle." Wright states that of 4340 convicts at one time in the Massachusetts penitentiary, 68 per cent were returned as "having no occupation." Frederick Wines, in a report on homicide in 1890, states that more than 74 per cent of the whole were said to have no trade. Dugdale, in the "Jukes", states that "after disease, the most uniformly noticeable trait of the true criminal is that he lacks continuity of effort. Steady, plodding work is the characteristic, not only of the honest and successful individual, but of all nations that have made their mark in history." His celebrated study of the "Jukes" is a study of the posterity of one degenerate man, embracing 540 direct descendents through five generations, 1200 persons all told and in some way related. He traced this progeny through court, prison and poor-house records. "Max Juke" and his clan cost the state of New York, in pauperism and crime, over one-and-a-quarter million dollars; more than $1000 for each individual. Only twenty (20) of the 1200 ever learned a trade or had a definite calling, and ten (10) of these learned it in prison, and even they were not regularly employed. The record reeks with idleness and crime. Over against it has been placed the history of the Edwards family, a galaxy of splendid lives, embracing more than 100 lawyers; 30 judges; 13 college presidents; more than 100 college professors; 120 Yale graduates; more than 100 clergymen, missionaries, and theologians; 75 officers in the army and navy; 60 prominent authors; diplomats at foreign courts; members of congress; 3 United States senators; and one vice president of the United States. Johnathan Edwards, the founder of this illustrious family, had these for his maxims:

Jukes-Edwards

1. Never to lose one moment of time, but to improve it in the most profitable way;

2. To live with all my might while I do live;

3. To eat sparingly, so as to "gain time", in order to "need less time for digestion after meals, less time for sleep," and "to be able to study more closely."

For years he spent "thirteen hours" daily in work. For 25 years he was pastor of a single church. Not only was he the greatest thinker of his generation—perhaps the greatest logicianAmerica has yet produced—he likewise had unbounded capacity for regular, persistent, methodical industry. Lecky points out that the chief

people more handy and practical for domestic life and better skilled in trade, but because they will give us citizens of an entirely different intellectual fiber."

These three schools, then, stand out clearly and distinctly in the field of industrial education. Personally I believe strongly in them all—in the *trade school*, because one of the fundamental ways in which a man can best serve society is by being self-supporting, and in defense of this position I call to witness the most heroic soul, save one, that ever walked among men. Paul, in a letter to Timothy, penned these words: "If any man provide not for his own, he has denied the faith and is worse than an infidel";—in the *technical school*, because of its splendid triumphs, because the high school demands it, and because I am ambitious for my native land; above all in the *public manual training school*, not alone because it is philosophically sound, or because intellectual training is preeminently its object, but because it opens the door of opportunity to the boy who can do things with his hands as well as to the boy who can remember things with his head.

Aside from the classes of schools found on American soil, and aside from our special interest in any one particular type, are the fundamental arguments in favor of all industrial education. These serve to transform works's legendary curse into a blessing. Primitive man, in order to produce enough to live upon, was compelled to work. Nature furnished him the resources: earth, air, water, timber, seed-wheat; and threw him upon them. She might have furnished him food. It is sometimes charged that nature is a cruel taskmaster in exacting so much labor for so much bread. The civilization of the hot belt of Darkest Africa is abundant answer to the complaint. Through labor man conquered nature, harnessed her forces, and set her to work in his own service. Through this struggle his powers were trained and nourished. To gather food, to find fuel, to weave clothes and to store up wealth against a time of need required industry, and industry has been the "maker and educator" of the race. Action and reaction are always equal. There is no single bodily act but stamps its impress upon the mental powers. In this struggle, as Drummond has so aptly said, man found not only "material satisfaction, he found himself. It was this that made him, body, mind, character and disposition." Gradually, harmoniously, parallel in time and place with man's mental life, there is:

Industrial Education

1. The advent of *methodical industry:* The capacity for methodical industry is God-given, is one of the most fundamental qualities for civilization, and among the most valuable of all heritages that a father can bestow upon his son. It has been shown that "an extreme emotional variability and impulsiveness, due to intermittent work in hunting, fishing and warfare, is the mark of a primitive or

Industry a Mark of Civilization

sight of in the workman. "Life is more than meat." "The things that are seen are temporal, but the things that are not seen are eternal;" and the grandeur of America will finally lie, not in the ware-houses and sky scrapers and trunk-lines so much as in the mind of the man that conceived them; not in the splendor of the stage curtain, nor the richness of the stage settings, nor the gorgeous costumes, nor the brilliancy of the jeweled candelabrum, nor the full score of the orchestra, nor even in the plot of the drama that is being enacted; but in the genius and character of the artist.

moral superiority of nations pervaded by a strong industrial spirit, over such as the Italians and Spaniards in whom this spirit is wanting, is veracity; that the usual characteristic of the latter nations is a certain laxity or instability of character, a proneness to exaggeration; a want of truthfulness in little things such as infidelity to engagements, due to the fact that where the industrial spirit has not permeated truthfulness rarely occupies, in the popular mind, the most prominent position, and is not recorded among the fundamentals of morality. He points out that veracity is the first virtue of the moral type; that more than anything else it is the test distinguishing a good man from a bad; and that veracity is strong in those nations pervaded by a strong industrial spirit. Idleness is the curse of the rich man's son. An idle brain is still the "devil's workshop." The American public school is worth all it costs if it taught nothing but regularity and persistence in effort:

Industry and Stability of Character

2. The advent of the *industrial arts:* Now and then we turn up on the prairie a curiously-wrought flint arrowhead, mute witness of man's attempt to adjust himself to his environment and to "subdue nature." The industrial arts still serve to differentiate civilized man from the savage. They are still used, by the most eminent authority, as the first criterion in ranking mankind as high or low in the scale of civilization; and—

Industrial Arts

3. The advent of *institutional life:* law, science, lettters, art, religion; the things of the spirit that constitute man's most valued heritage.

Institutional Life

Briefly, then, the advocates of industrial education sum up the arguments: Industry, through the "struggle for existence," has been the means that God has used in making and educating the race. Shall mankind use this instrument, or is mankind wiser than deity?

We need clear-headed pilots just here. The basis of our civilization is material. No man is educated who is out of sympathy with the work-a-day world. Our material development is nothing less than marvelous. Industry and science are the most efficient servants of mankind in the modern world. Wealth, learning, letters, the fine arts and higher culture wait upon the industrial arts: mechanics, the art that constructs houses; agriculture, the art that transforms the barren prairies of North Dakota into gardens of plenty; transportation, the art that annihilates space and multiplies man's world; manufacture, the arts that ministers to man's numerous wants and stores his home with articles of beauty and use; printing, the art that has made him heir of all the learning of all the ages. All these contribute vastly to our civilization and are eminently worth while, but in the final analysis the man should never be lost

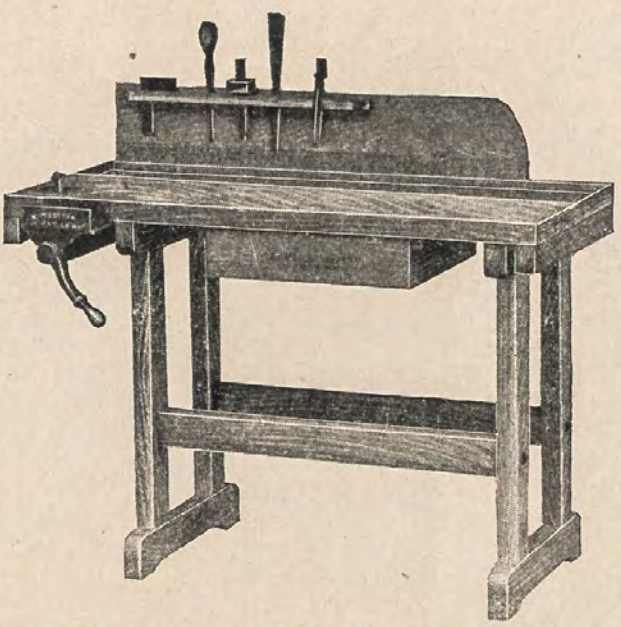
Industry and Science

MANUAL TRAINING IN HIGH SCHOOL COURSES.

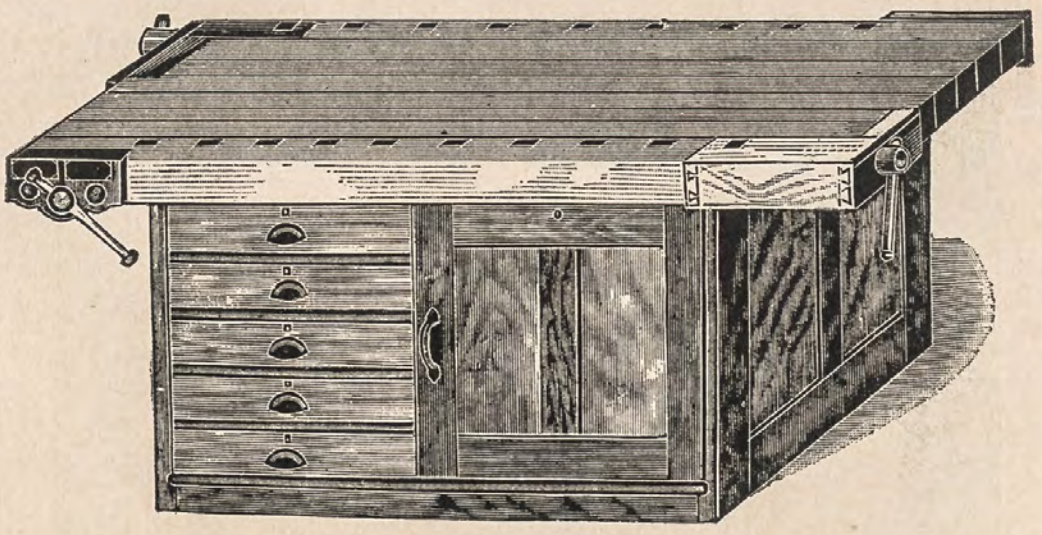
A. E. DUNPHY, DIRECTOR OF MECHANIC ARTS; CHARLOTTE COFFIN, DIRECTOR OF DOMESTIC ARTS AND SCIENCE; NORTH DAKOTA NORMAL AND INDUSTRIAL SCHOOL

Manual Training has passed the stage of argument and its gradual introduction into public schools must be apparent to all observers. The gradual triumph of the manual training idea and its successful invasion of eductional reserves have not come about by chance. As much as we laud our present system of education and admirable as it is in many respects, it nevertheless lacks somewhat the breadth of training afforded under the old regime when school and life conspired to train boys and girls into all 'round characters, fitted for the stern realities of the work-a-day world in which they were to live. Formerly, in the spring, when the short term of school had closed, the boy learned a trade and became a more or less skillful artisan. He worked on the farm during the summer, developed a rugged physique and came to know nature at first hand. In the fall and winter he attended school and acquired at least the rudiments of an edcation. In many respects the girl's education resembled the boy's. Narrow as it may at first appear, such a system was in reality generous, efficient, and produced sturdy, resourceful, energetic, industrious men and women. As population multiplied and division of labor ensued the school term was lengthened, the trade eliminated, the summer period shortened, and for all too many boys and girls farm life and the constant intercourse with nature have become a condition unknown. As the school term has been lengthened the purely intellectual training of the child has been increased. More and more has the system conspired to concentrate its effects upon certain mental faculties while the motor areas, and the constructive and executive impulses have been neglected. There is a feeling, manifest in many quarters, that not only must the school train thinkers,—it must train thinkers who will work. The young man who believes, because he has had a certain mental training, that he does not have to work, is in a dangerous way. Boards of Education are quite generally convinced of the excellent results obtained through manual training. The question is no longer *why* but *how*.

In general, the main difficulty lies in the financial requirement incident to its introduction. It should be understood that any plan which may be suggested for the introduction of manual training into public school work must invariably be modified to meet local conditions. The greater the number of teachers, the more generous the appropriations for school work, the more adequate and far-reaching



The type of bench used depends largely upon available space and funds. The above cut represents a type of individual bench designed for elementary wood work in manual training. This bench is 4 ft. long, 20 inches wide, 32 inches high, with a maple top 1¾ inches thick and a 7-inch well for tools. It is equipped with wood vises, though iron may be substituted and often prove more satisfactory. For twenty such benches a room 30 ft. by 40 ft. will suffice. Such benches may be had at prices ranging from $8.00 to $12.00 each.



The above illustration shows a "double bench" at which two pupils are supposed to work. The top of this bench is made of alternating strips of maple and cherry, glued together. The draws are designed to contain the individual tools such as planes, chisels, and all edged tools, and the cubpoard to contain the general bench tools such as hammers, oil cans, oil stones, etc. Such benches are more expensive, ranging in price from $15 to $20 each.

should be the preparation and consequently the more efficient the system. The various items that the Superintendent, Principal and Board of Education will need to consider may be grouped under the following heads.

I—THE TEACHER

No other element in connection with the work of the school is of so much importance as the teacher. As the teacher so the school. Here, as elsewhere, knowledge, skill, a high moral standard and the proper conception of the mission of the public school will be the determining forces. Nothing can so influence mind and character as mind and character. More depends upon what the teacher *is* than upon his share in the teaching. A teacher of culture with a comprehensive knowledge of the subject to be taught and with an appreciation of its relative position and importance in a general scheme of education is much more to be desired than a dextrous mechanic whose ultimate aim will be the perfect article rather than the perfect character. Where three of four years of mechanic arts are offered for high school pupils a trained teacher from one of the leading manual training schools is a necessity. He should devote his entire time to his special work and in no case should his wages be less than is paid other high school teachers. Where less than four years of mechanic arts are offered it is possible to find a teacher who can handle the work and in connection therewith devote part time to other lines. Where but a single year is proposed a capable architect of exemplary habits and trained in the use of tools may, *if necessary*, be employed to take the class. Mechanics and graduates of engineering courses are often employed. The latter are to be preferred, though neither will equal the trained teacher of manual training who has not only the technical skill but the correct view point.

II—ORGANIZATION

(A) FOR BOYS

In order to an intelligent comprehension of a four-years' course in mechanic arts the following brief synopsis is given. A full course would embrace the following lines of instruction:

I Joinery, Carpentry, or Bench Work.

Grade: Usually carried on in grades VII, VIII, and IX.

Room: This shop requires a light airy room, preferably on the first floor. In case a basement is used it is well ventilated and free from dampness.

Equipment: Benches, individual tools, special tools with a case for the same, blackboard, etc.

Course: A series of joints or a series of joints and projects so planned as to relate intimately to the everyday life and interest of the pupil.

Manual Training Shop, Horace Mann High School, New York.

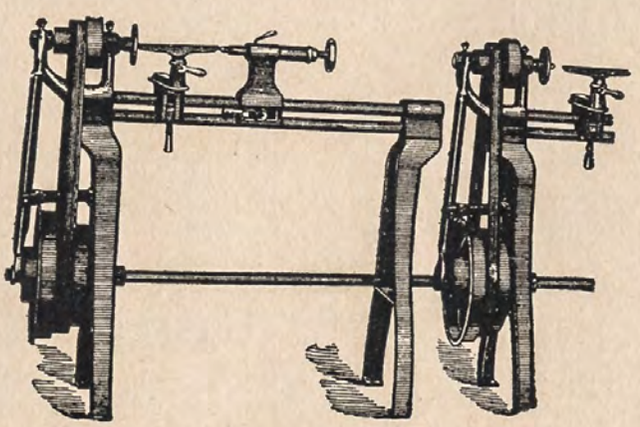
II Turnery or Lathe Work.

Grade: Commonly offered in the first or second year of the high school.

Room: Light, airy, and convenient to the bench shop.

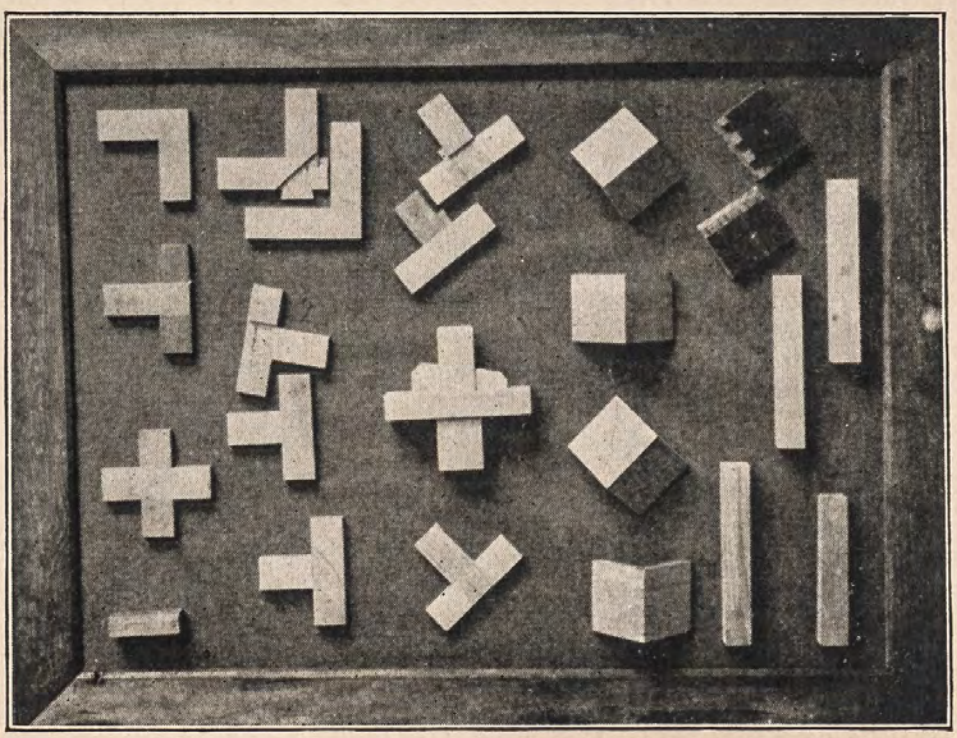
Equipment: Lathes, lathe tools and power are necessities.

Course: Set exercises; useful articles; pattern making.

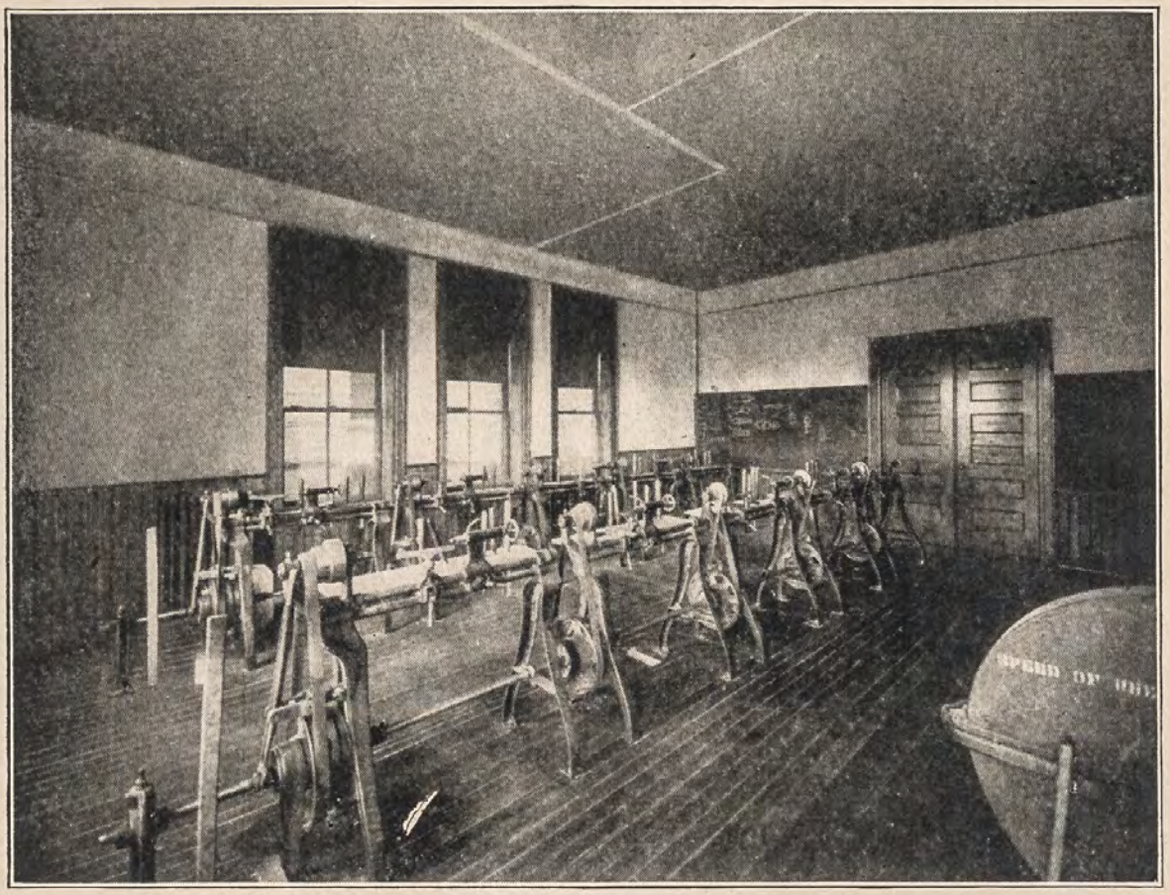


The above represents a style of lathe in quite common use. For motive power electricity, if available, is most satisfactory. In many schools lathes are driven by steam, gas or gasoline engine. Lathes driven by foot-power will, as a rule, prove poorly adapted to

Above is shown a double bench designed and used at the Normal-Industrial School. The total cost, equipped, may be bought within $20.00.



Course in Joinery, First Year Work, North Dakota Normal-Industrial School.



Wood Lathe Room, North Dakota Normal-Industrial School

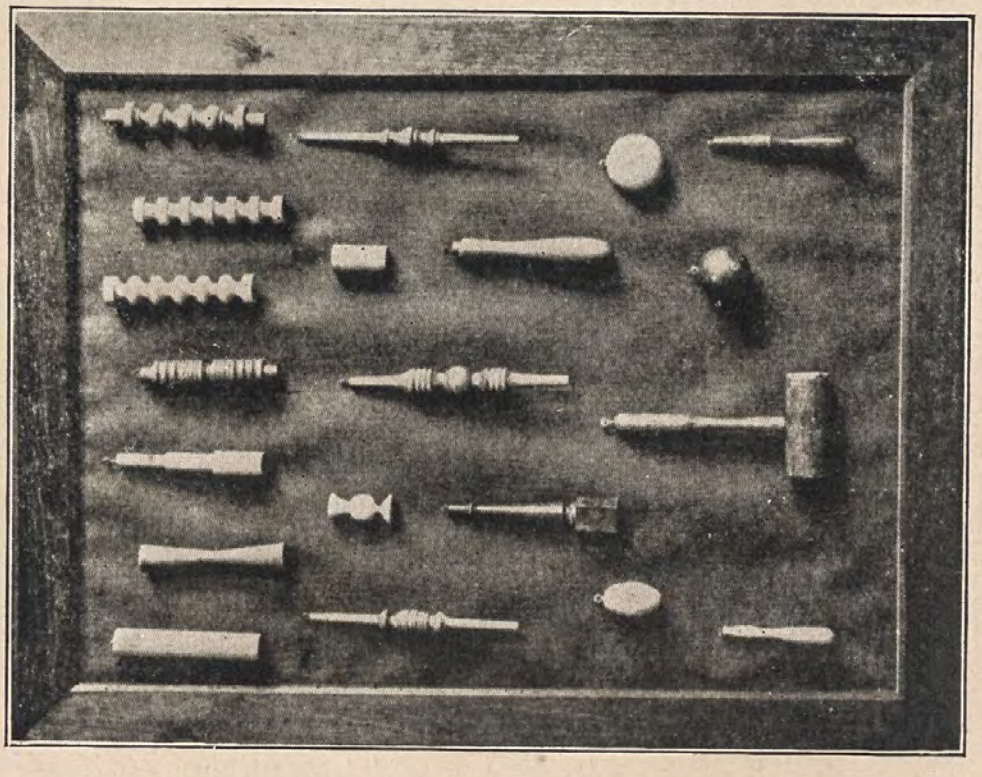
III Molding.

Grade: Foundry work occupies a part of the second or third year of the high school course:

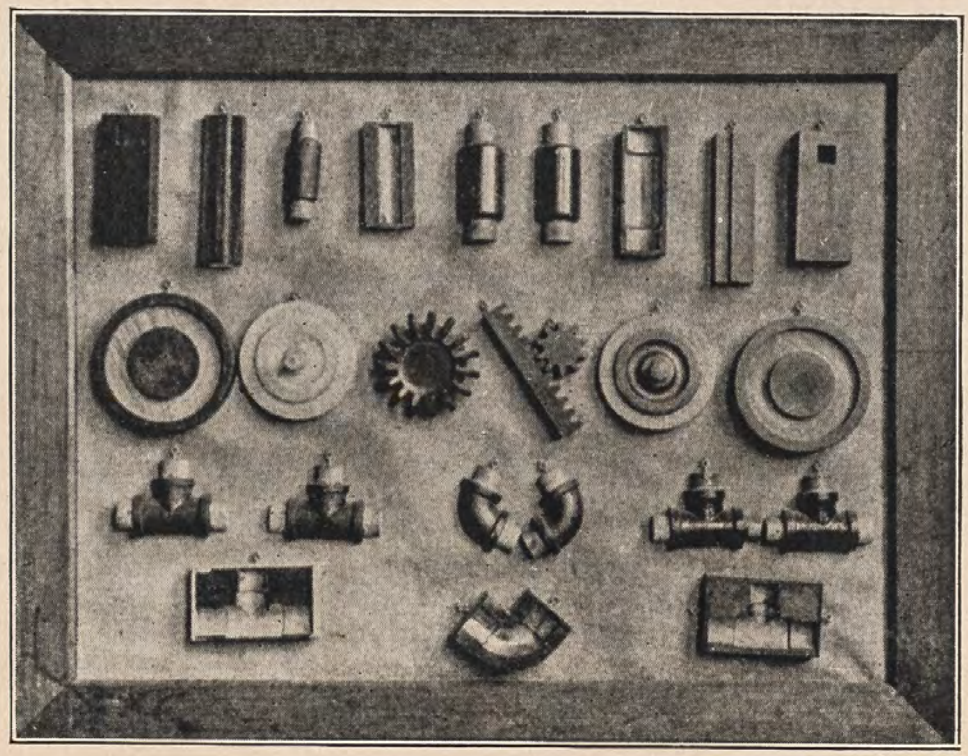
Room: Molding rooms are commonly located in the basement.

Molding Bench designed and used at the North Dakota Normal-Industrial School.

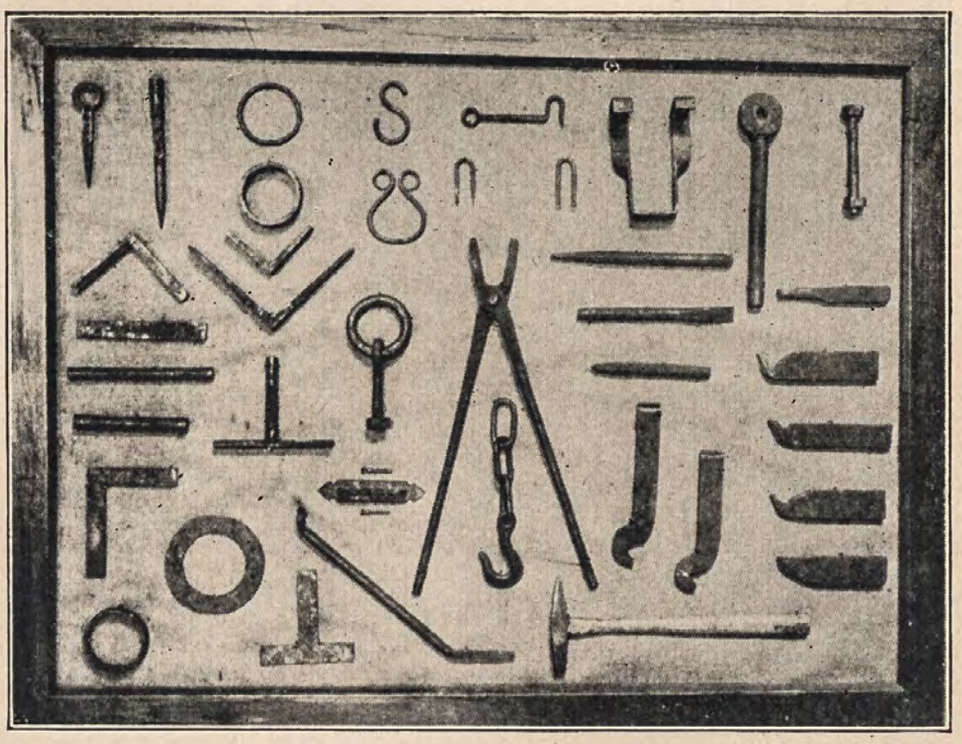
school use. The mastery of this machine will serve to awaken the pupils to innumerable objects which before have escaped attention.



Course in Turnery, North Dakota Normal-Industrial School.



Course in Pattern Making, North Dakota Normal-Industrial School.



Course in Forging, North Dakota Normal-Industrial School.

Blacksmith Shop, North Dakota Normal-Industrial School equipped with Buffalo Downdraft Forges.

Equipment: Furnace for melting the metal, ladles for pouring, molding benches, molding flasks, core oven, small tools, etc. Casting is commonly done in plaster of Paris, babbit metal, lead, brass and iron from patterns made by the pupils. Iron and steel casting is technical and expensive and is offered by but few high schools.

Course: The work in molding supplements the work in turnery and joinery.

Molding Room, North Dakota Normal-Industrial School.

IV Forging or Blacksmith Work.

Grade: Commonly offered in the second year of the high school, though in some schools it is a third year subject.

Room: A well-lighted and ventilated shop on the ground floor.

Equipment: Forges, anvils, tongs, water tanks, hammers, cutters, punches, etc. Two types of forges are in use in forge shops. In one, the overhead, the smoke and gases are led through pipes to the main chimney or exhaust. In the other, the down draft, the shop is equipped with blower and exhaust for supplying the fires with fresh air and for removing the smoke and gases from the room.

Course: Heating, drawing out, bending, swaging, fullering, welding, etc. The course includes such useful articles as brackets, braces, shackels, swivels, tongs, bolts, hammers, etc.

tific and expensive and their mastery represents a high degree of mental attainment.

Course: Bench work in chipping and filing, and machine shop practice.

VI Mechanical Drawing.

Grade: Grades IX, X, XI, XII.

Room: Large, airy, with abundant light well diffused. A northern exposure is to be preferred. In many cases the drawing is done in the regular bench shop.

Equipment: Benches, drawing boards, compasses, pens, pencils, scales, lengthening bars, T squares, triangles, curves, tacks, ink, etc.

Course: The description by which the mechanical processes are logically developed and brought to a definite and practical form. Drawing and construction are complementary processes. The drawing refers to the shop work and the shop work reflects the drawing. In many schools every piece of shop work is executed from drawings made by the pupils. In others, the drawing and construction are less closely correlated.

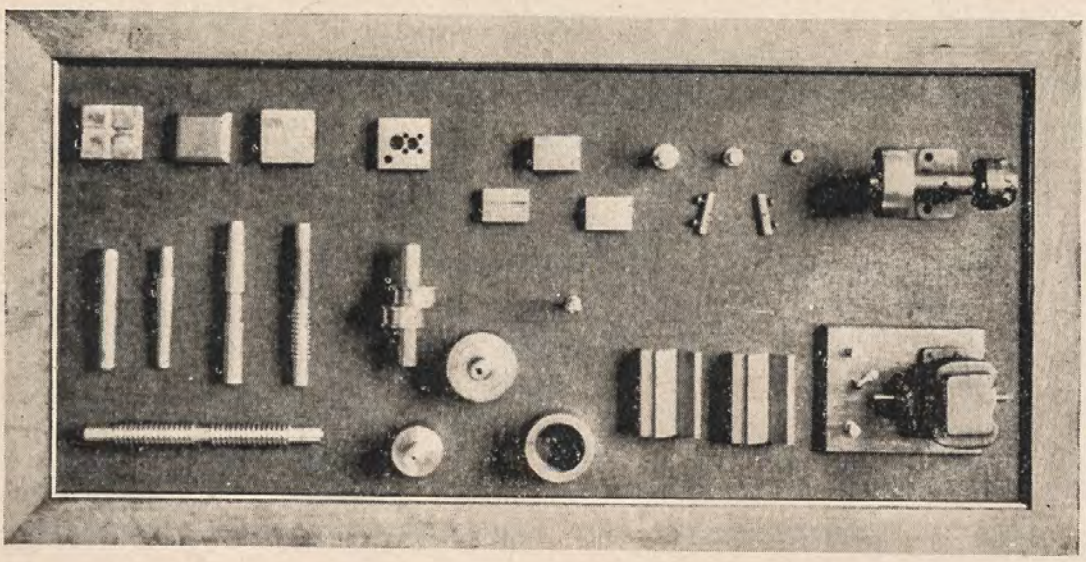
Drafting bench, designed and used at the North Dakota Normal-Industrial School.

V Machine Tool Construction.

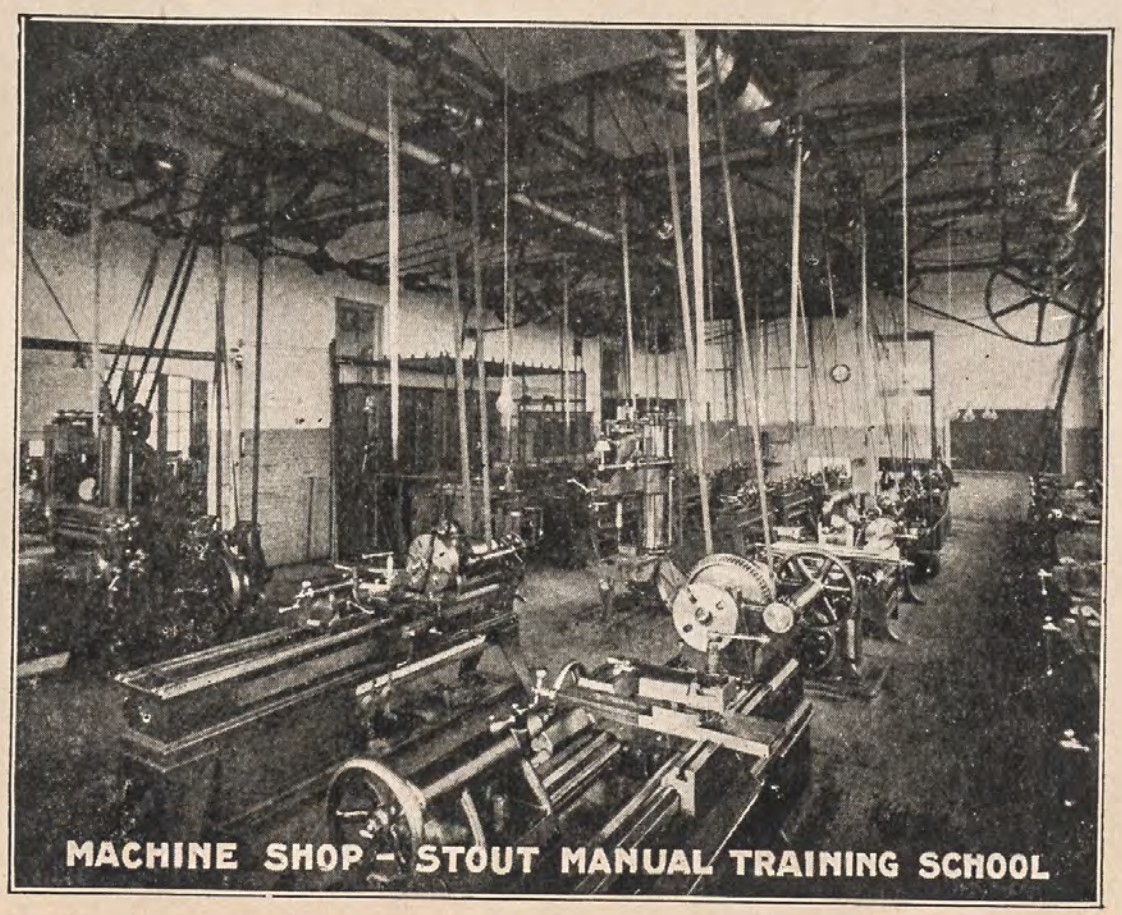
Grade: Fourth year of the high school.

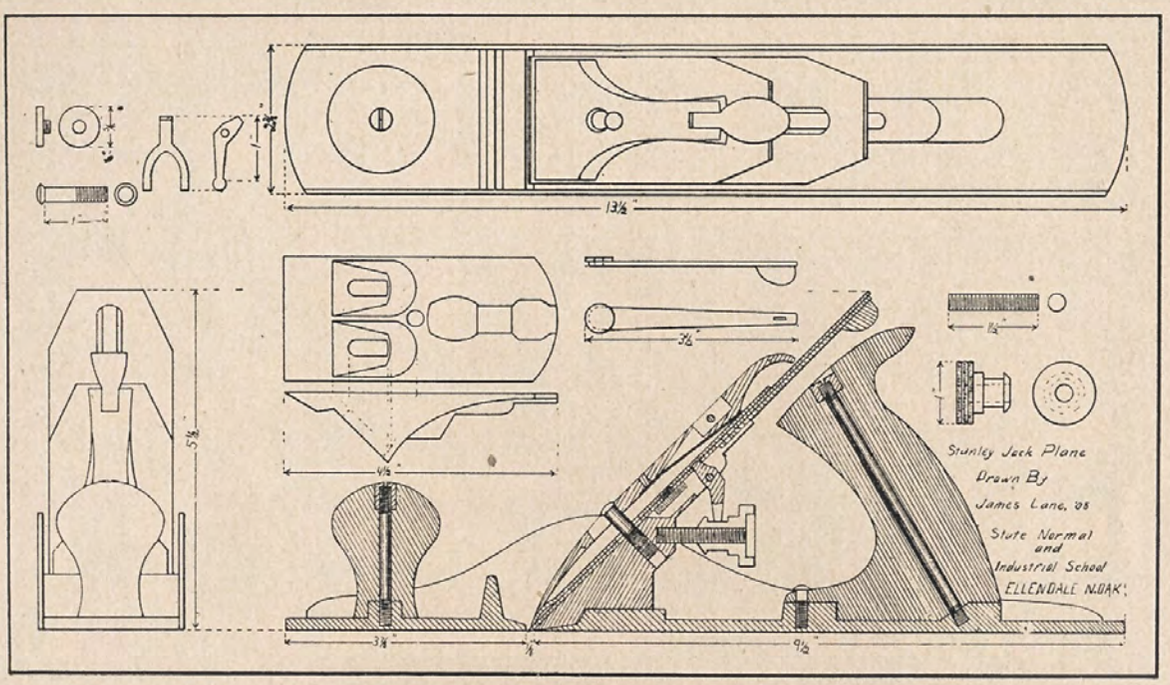
Room: Light, airy, and roomy.

Equipment: The equipment consists of engine lathes, planer, shaper, drills, grinders, vises, files, dividers, punches, chisels, etc. This is the most expensive shop. The machines are complex, scien-

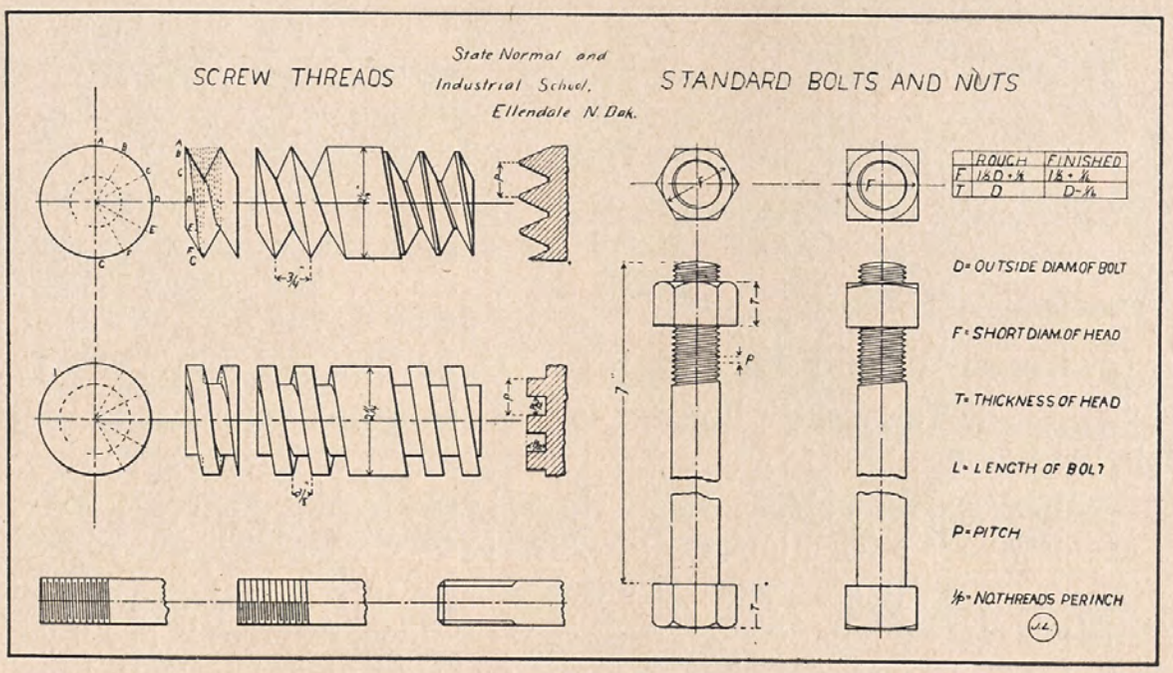


Course in Machine Tool Construction, Central Manual Training School, Philadelphia.

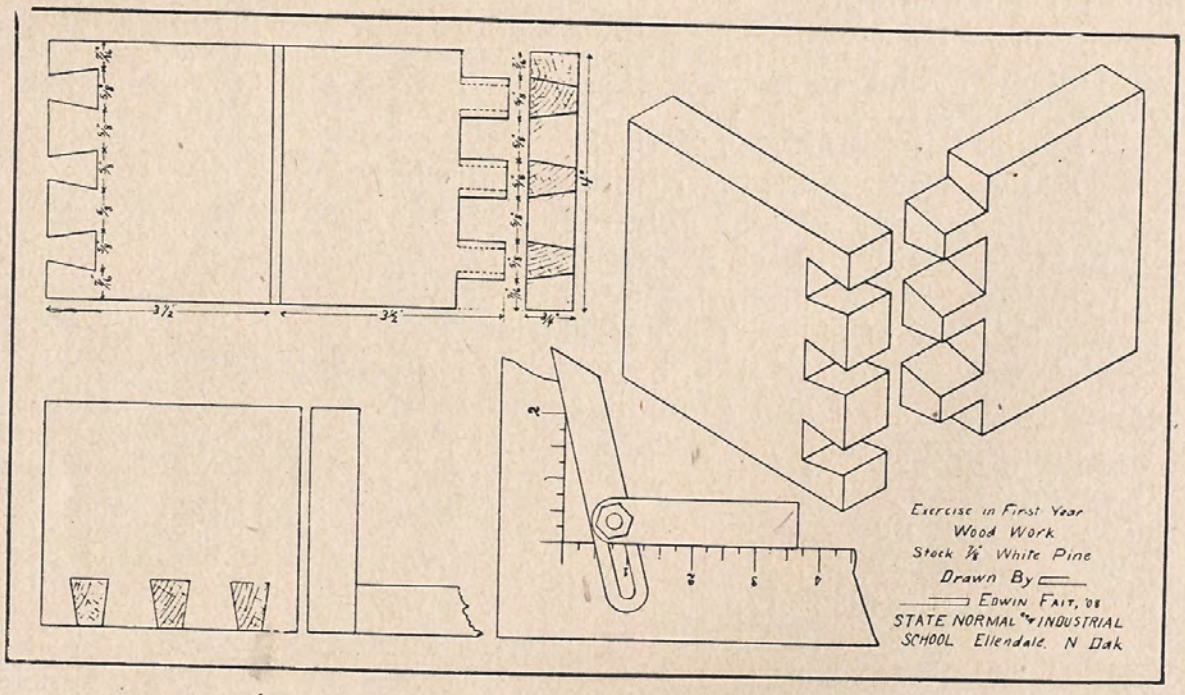




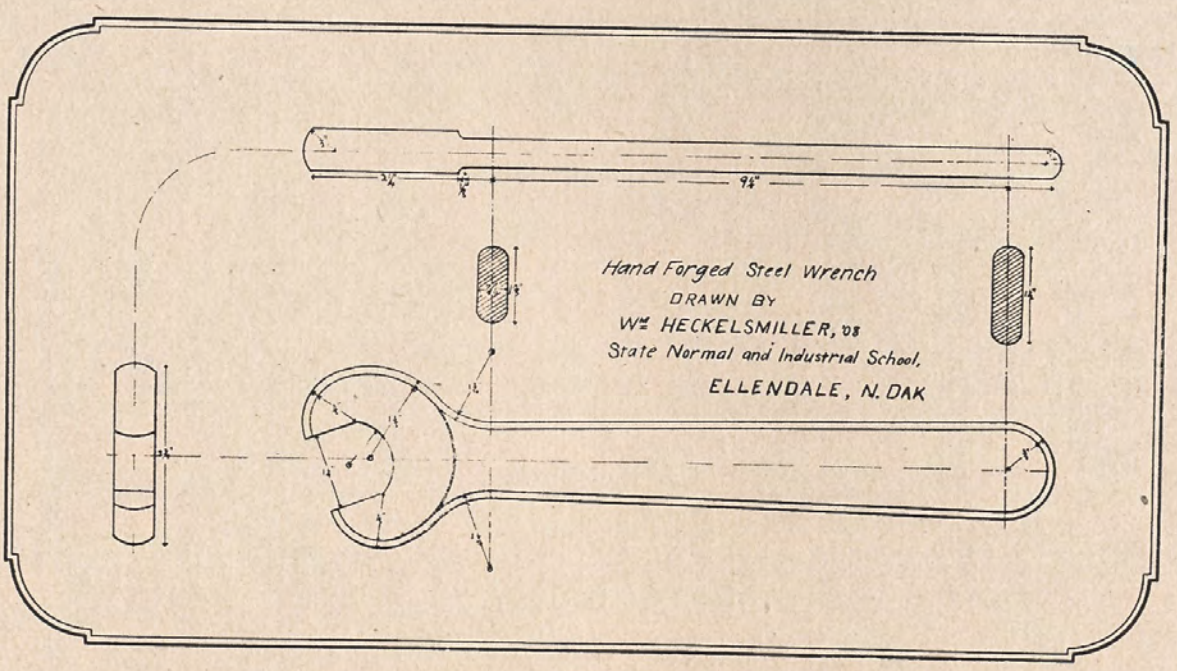
Constructive Drawing, Third Year.



Constructive Drawing, Fourth Year



Constructive Drawing, First Year.



Constructive Drawing of Forge Work, Second Year.

Sewing Room, North Dakota Normal-Industrial School.

II Cooking.

Grades: Grades XI and XII.

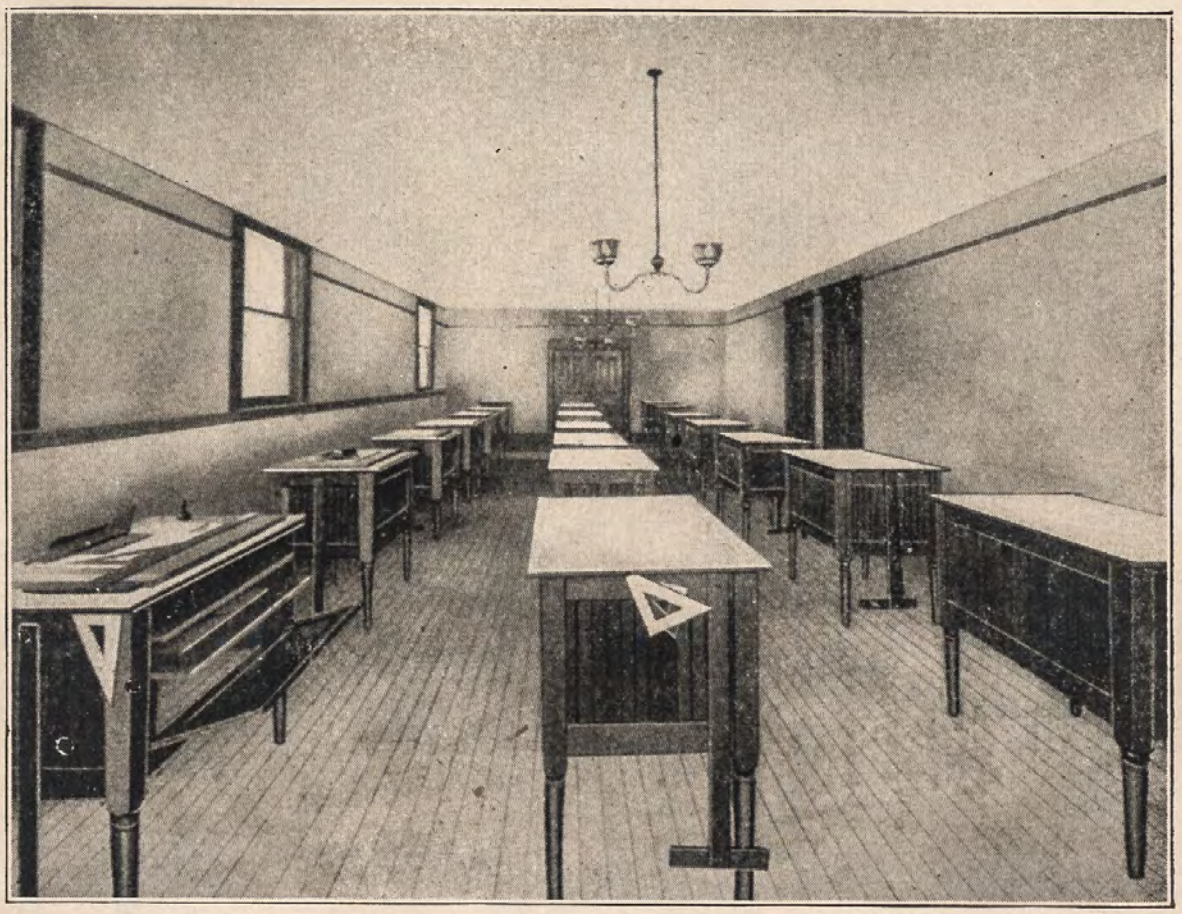
Rooms: Kitchen, dining and store room.

Equipment: Tables, stoves, cooking utensils, etc.

Course: Classification of foods; principles and methods of cooking and serving; planning and buying; food values; home sanitation and economics; physiology and bacteriology, etc.

From the above it will be seen that the work in American Manual Training Schools, offering a complete course, embraces the following lines of work:

1. Joinery. Work adapted to both grammar and secondary grades.
2. Turnery or Lathe Work, including Pattern Making.
3. Molding.
4. Forging.
5. Filing, Fitting and Machine Shop Practice.
6. Drawing.
7. Sewing.
8. Cooking.



Mechanical Drawing Room, North Dakota Normal-Industrial School

(B) FOR GIRLS

I Sewing.

Grades: Usually offered in grades IX and X.

Room: There should be ample space and the room must be well lighted.

Equipment: Tables, chairs, stove, irons, ironing boards, mirror, scissors, yard sticks, lockers, machines, etc.

Course: First year: Study of stitches and materials; review of stitches if sewing has been taught in the grades; training in accuracy of measurement; drafting, making and finishing. Second year: Measuring, drafting, cutting, fitting and making; cutting from patterns; planning and purchasing; remodeling and mending.

rolling 48 boys in first year courses will require 24 benches with necessary tools, the instructor devoting half day (four periods) to the work and the class working in two sections. Under similar conditions, the work being elective, 12 benches with necessary tools will suffice. A liberal estimate for equiping a twelve bench shop with benches, individual and special tools, is $200. Where benches are "home made" the expense may be reduced. Bench work and drawing, as herein contemplated, constitute the entire manual training course in many small and middle-class high schools.

The necessary expense may be estimated about as follows:

12 single benches	$100.
12 sets of individual tools at $5.00	60.

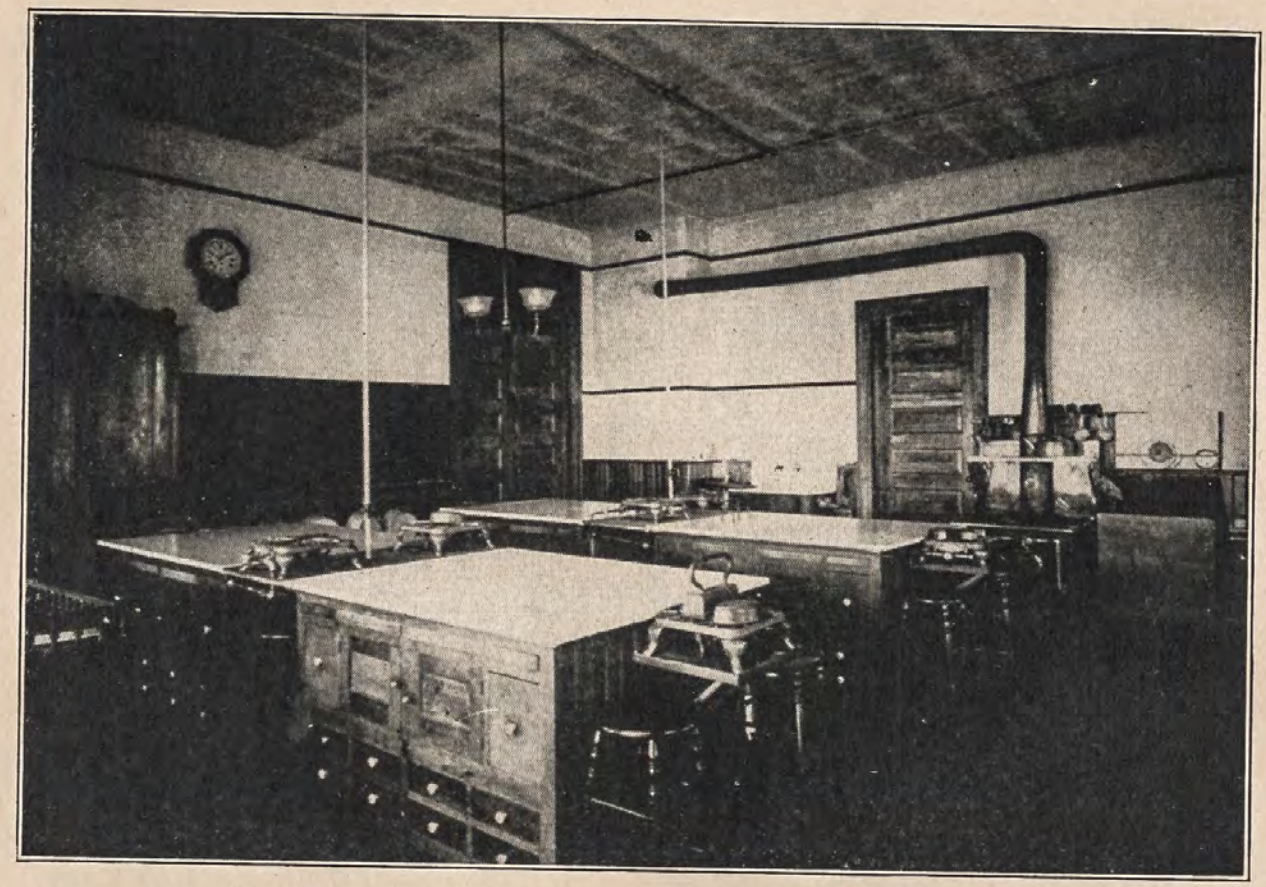
Each set to include the following:

- 1 No. 5 Bailey iron plane.
- 1 10-inch back saw, good quality.
- 1 adz eye hammer.
- 1 6-inch iron try square.
- 1 2-ft., 2-fold boxwood rule.
- 1 $\frac{3}{8}$-inch tang chisel with handle.
- 1 $\frac{3}{4}$-inch tang chisel with handle.
- 1 Swedish sloyd knife.
- 1 9-oz. bench brush.
- 1 4-inch screw driver. Champion pattern.
- 1 boxwood marking guage.
- 12 oil stones.
- 12 bronzed oil cans.

1 set of special tools, including:	20.

- 1 set, 13, $\frac{1}{4}$ to 1-inch auger bits.
- 1 8-inch ratchet brace.
- 1 countersink.
- 1 screw driver bit.
- 1 8-inch draw knife.
- 1 26-inch rip saw.
- 1 24-inch cross cut saw.
- 3 cabinet scrapers.
- 3 10-inch, half-round cabinet files.
- 1 6-inch coping saw with 12 extra blades.
- 1 steel framing square, 18x24 inches.
- 6 6-inch malleable iron clamps.
- 6 3-ft. malleable cabinet clamps.

1 30-inch grindstone	8.
Total	$188.



Section of Cooking Laboratory, Normal-Industrial School.

REMARK: The above brief discussion gives but the merest outline of a manual training high school. In no sense does it pretend to be exhaustive or a categorically precise statement of general usage. To fully discuss the work of a manual training high school would require a volume. In many schools the course will differ materially from that indicated. This brief sketch is merely designed to afford school men, who know little or nothing of manual training and who find themselves supervising and equipping schools, an opportunity to view the field in the large, in the confident belief that investigation will result in action.

Recommendation: The course of study and equipment comprehended in the above scheme are possible for only first class high schools in large cities where generous provision is made for educational purposes. Under conditions prevailing at present in North Dakota the State Normal-Industrial School recommends the introduction of one year of manual training in high school courses as indicated below. Lathe and forge work are entirely feasible for the larger high schools of the state.

1. *Bench Work:* Correlated with drawing for ninth grade boys. The work may be made elective or compulsory as may seem best, but it is strongly recommended that at least one year's work be required of all boys. Where the work is required, high schools en-

Drawing (4) for boys	8
Domestic Science (4)* Domestic Arts (2), Drawing (2) for girls	8
Physical Training	2

Fifteen periods of prepared work required. Laboratory subjects—natural science, manual training, mechanical drawing, physical training, needlework and art—are rated at half the number of periods assigned to them. Figures show number of recitations per week.

Horace Mann High School

Required	Credits per week	Elective	Credits per week
English	3	Latin	5
History	3	French	3 or 5
Physical Training	1 (4)†	Mathematics	5
Music	1	Manual Train.	1 (4)†

Here the Manual Training is elective. In addition to the required studies a sufficient number of electives must be taken to give a credit of fifteen hours per week.

Saint Paul Mechanic Arts High School

Algebra	5
Latin, German or French	5
History and English	5
Manual Training	5
Drawing	5
Total	25

Boardman, New Haven, Manual Training Course

For Boys		For Girls	
English	3	English	3
History	3	History	3
Algebra	5	Algebra	5
Physical and Commerc. Geog.	4	German or Latin	5
Drawing	4	Drawing—freehand	2
Woodwork	6	Sewing	3
	—	Cooking	3
	25		—
			24

A reasonable adjustment of ninth grade subjects would be as follows:

Latin Course		English Course	
Algebra	5	Algebra	5
Latin I	5	Bookkeeping	5
English I	5	English I	5
Manual Training—boys	5 or 10	Manual Training—boys	5 or 10
Sewing or Drawing—girls	5 or 10	Sewing or Drawing—girls	5 or 10
	20		20

* Periods per week. † Elective.

The necessary drawing instruments will consist of the following for each pupil. The expense is small.

1 30-inch T square.
1 45° triangle.
1 30°-60° triangle.
Protractor.
India ink.
Thumb tacks.

Drawing board, 20x30 inches, made of well seasoned white pine. May be made by the pupil.

Set of drawing instruments. The student should own these. It is poor economy to purchase a set of cheap instruments.

Schools planning to introduce lathes, forges, etc., may obtain estimates through the State Normal-Industrial School.

2. *Sewing:* The study of stitches and materials, drafting, cutting and making. The necessary equipment for 30 girls in sewing, the teacher devoting a half day to the work and the class working in two sections two periods per day, would include the following.

2 5-ft. tables:	$5.00
An inexpensive table may be had by using boards and saw horses.	
15 sewing tables	$15 to 30.00
15 chairs at $7.50 per dozen	9.37
15 scissors, 3 of them buttonhole	5.00
15 tape measures	.60
Total	$49.97

Schools contemplating the introduction of equipment to provide for dressmaking and domestic science may obtain estimates through the State Normal-Industrial School.

III—THE CURRICULUM

As far as possible the work should correlate with other branches of instruction. The work itself should be such as to encourage the inventive and constructive powers of the pupils. During the first two years two periods of shop work, at least one hour per day, is a fair proportion of time. The following schemes will serve to indicate what is required in the ninth grades of a few well known high schools where manual training is offered:

HIGH SCHOOL COURSES, GRADE IX

Brookline (N. Y.) High School

	Periods per week
English	4
Algebra	4
Zoology and Botany	4
Manual Training (4) and Mechanical	

Brief Biography of Manual Training Books

Problems in Woodworking. W. M. Murray.
Wood Pattern-Making. H. T. Purfield.
Forge Practice. John L. Bacon.
Notes on Mechanical Drawing. Frank E. Mathewson.
Elements of the Theory and Practice of Cookery. Mary Williams and Katherine Fisher.
Economics of Manual Training. Louis Rouillon.
Elementary Woodworking. E. W. Foster.
Hand and Eye Training. Woldemar Goetz.
The School and Society. John Dewey
Bench Work in Wood. Goss.
Educational Manual Training. Schwartz
Course in Mechanical Drawing. Louis Rouillion
Mechanical Drawing. Cross.
Problems in Furniture Making. Crawshaw
Argument for Manual Training. Butler.
Machine-Shop Tools and Methods. Leonard
Manual Training Magazine. Published at Peoria, Ill.

A few well known firms that will send catalogues and prices upon request:

Orr & Lockett, Chicago.
E. H. Sheldon & Co., Chicago.
Grand Rapids Hand Screw Co., Grand Rapids, Mich
C. S. Van Deusen, Peoria, Ill.
Eugene Dietzgen & Co., Chicago.
C. Christiansen, Chicago.
Chas. H. Strelinger Co., Detroit, Mich.
Buffalo Forge Co., Buffalo, N. Y.
F. E. Reed Co., Worcester, Mass.
Columbia School Supply Co., Indianapolis, Ind.
Hammacher, Schlemmer & Co., New York City
Senaca Falls Mfg. Co., Senaca Falls, New York.
Henry Disston & Sons, Chicago.
Whiting Foundry Equipment Co., Harvey, Ill
American Blower Co., Detroit, Mich.
O. L. Packard Machinery Co., Chicago.
Northern Machinery Co., Minneapolis, Minn.
W. F. & John Barnes Co., Rockford, Ill.